Scientifics Computing Libraries in Python

1. **Scientifics Computing** Libraries

Pandas
(Data structures & tools)

NumPy
(Arrays & matrices)

Pandas is actually built on top of NumPy

Visualization Libraries in Python

2. **Visualization** Libraries

Matplotlib
(plots & graphs, most popular)

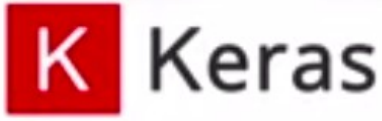
Seaborn
(plots : heat maps, time series, violin plots)

Another high-level visualization library, Seaborn, is based on matplotlib.

Machine Learning and Deep Learning Libraries in Python

3. Machine Learning and Deep Learning

Scikit-learn
(Machine Learning : regression, classification, ...)



Keras
(Deep Learning Neural Networks, ...)

For deep learning, Keras enables you to build the standard deep learning model.

Deep Learning Libraries in Python

3. Deep Learning Libraries

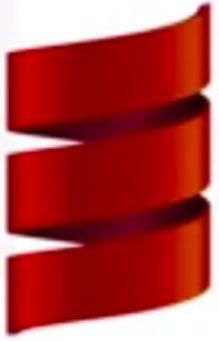
TensorFlow
(Deep Learning: Production and Deployment)

PyTorch
(Deep Learning: regression, classification,...)

Pytorch is used for experimentation, making it simple for researchers to test their ideas

Scala-Libraries

- Vegas
- Deep Learning: Big DL



For deep learning, you can use BigDL.

R- Libraries

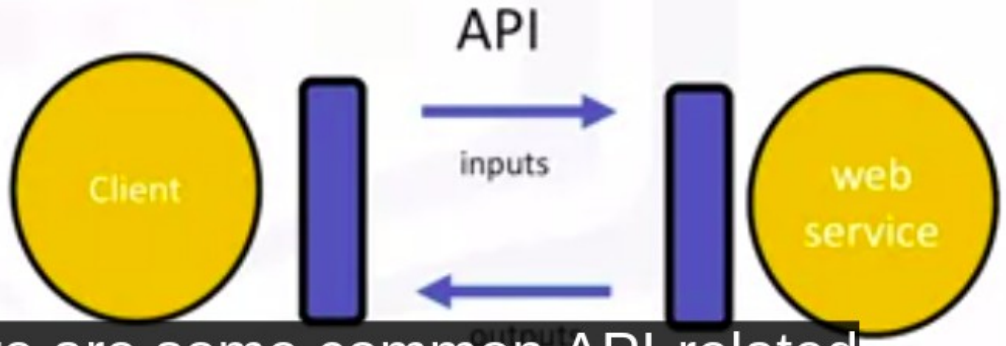
- Ggplot2
- You can also Libraries that allow you to interface with Keras and TensorFlow

to interface with Keras and TensorFlow.

"Representational," the S stands for "State,"
the T stand for "Transfer." In rest APIs,

REST APIs

- REST APIs are used to interact with web services,
  i.e., Applications that you call through the internet
- They have a set of Rules regarding:
  1. Communication
  2. Input or Request
  3. Output or Response



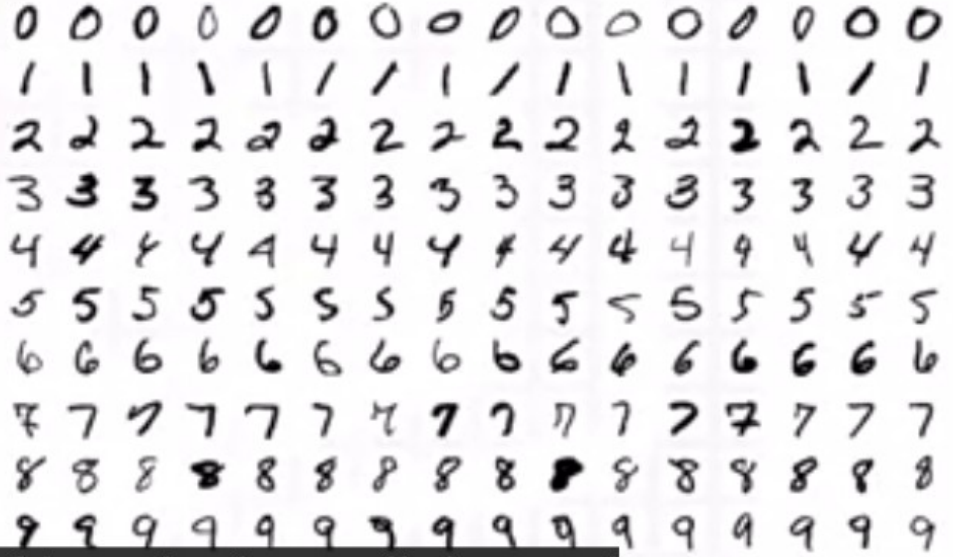
Output or Response. Here are some common API-related terms. You or your code can be thought of

the audio file to the API; this process is called a post request. The API then sends

The Watson Language-Translator API provides another example. You send the text you would

What's a data set

- Collection of data
- Data structures
  - Tabular data
  - Hierarchical data, network data
  - Raw files



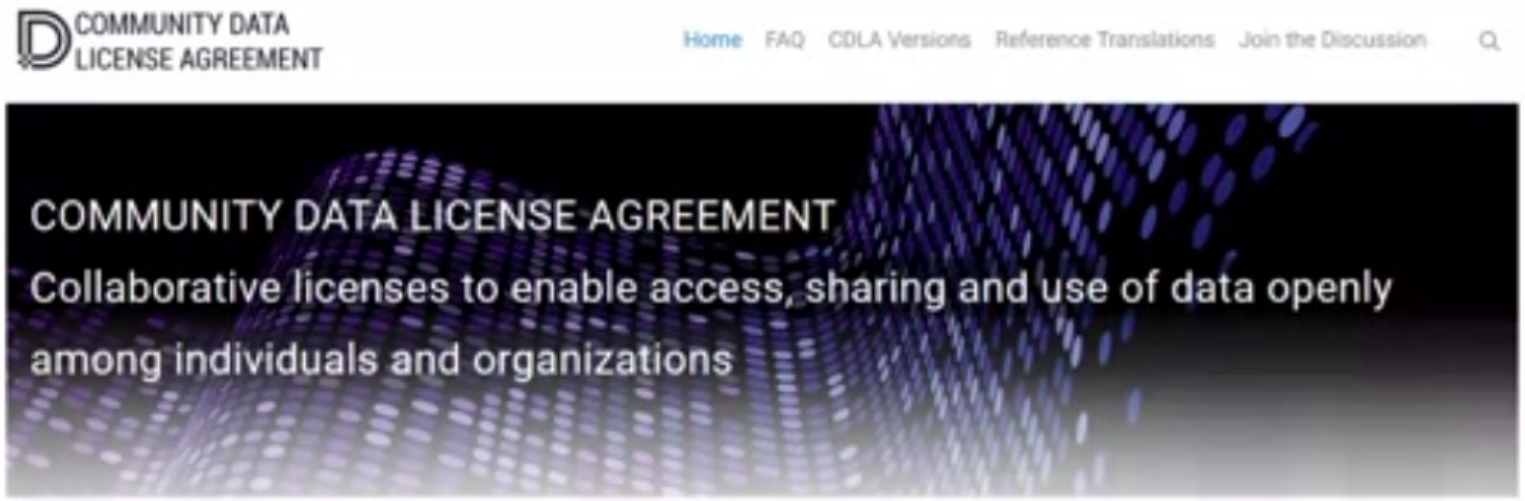
It contains images of handwritten digits and is commonly used to train image processing

Data Ownership

- Private data
  - Confidential
  - Private or personal information
  - Commercially sensitive
- Open data
  - Scientific institutions
  - Governments
  - Organizations
  - Companies
  - Publicly available

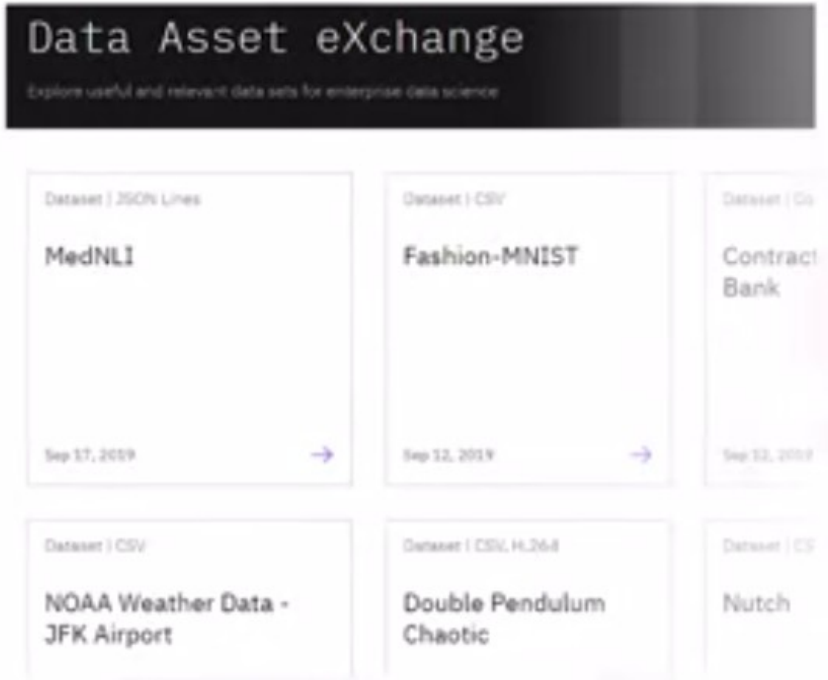
on a wide variety of data sets.

Community Data License Agreement



- http://cdla.io – A Linux Foundation project
- CDLA-Sharing: Permission to use and modify data; publication only under same terms
- CDLA-Permissive: Permission to use and modify data; no obligations

The Data Asset eXchange



- Curated collection of data sets:
  - From IBM Research and 3rd party
  - Multiple application domains
- Data Science friendly licenses

https://developer.ibm.com/exchanges/data/

What is a model?

- Data can contain a wealth of information
- Machine Learning (ML) models identify patterns in data
- A model must be trained on data before it can be used to make predictions
- Supervised, unsupervised and reinforcement learning are types of ML

Supervised Learning

- Supervised Learning
  - Data is labeled and model trained to make correct predictions
- Regression
  - Predict real numerical values
  - e.g. home sales prices, stock market prices
- Classification
  - Classify things into categories
  - e.g. email spam filters, fraud detection, image classification

Other learning types

- Unsupervised Learning
  - Data is not labeled
  - Model tries to identify patterns without external help
  - Common learning problems: clustering and anomaly detection

- Reinforcement Learning
  - Conceptually similar to human learning processes
  - e.g. a robot learning to walk; chess, Go and other games of skill

Deep Learning

- Tries to loosely emulate how the human brain works

- Applications
  - Natural Language Processing
  - Image, audio, and video analysis
  - Time series forecasting
  - Much more
- Requires typically very large datasets of labeled data and is compute intensive

Deep Learning Models

- Build from scratch or download from public model repositories
- Built using frameworks, such as:
  - TensorFlow
  - PyTorch
  - Keras
- Popular model repositories
  - Most frameworks provides a “model zoo”
  - ONNX model zoo

Using models to solve a problem

What is this?

Prepare data → Build model → Train model → Deploy model → Use model

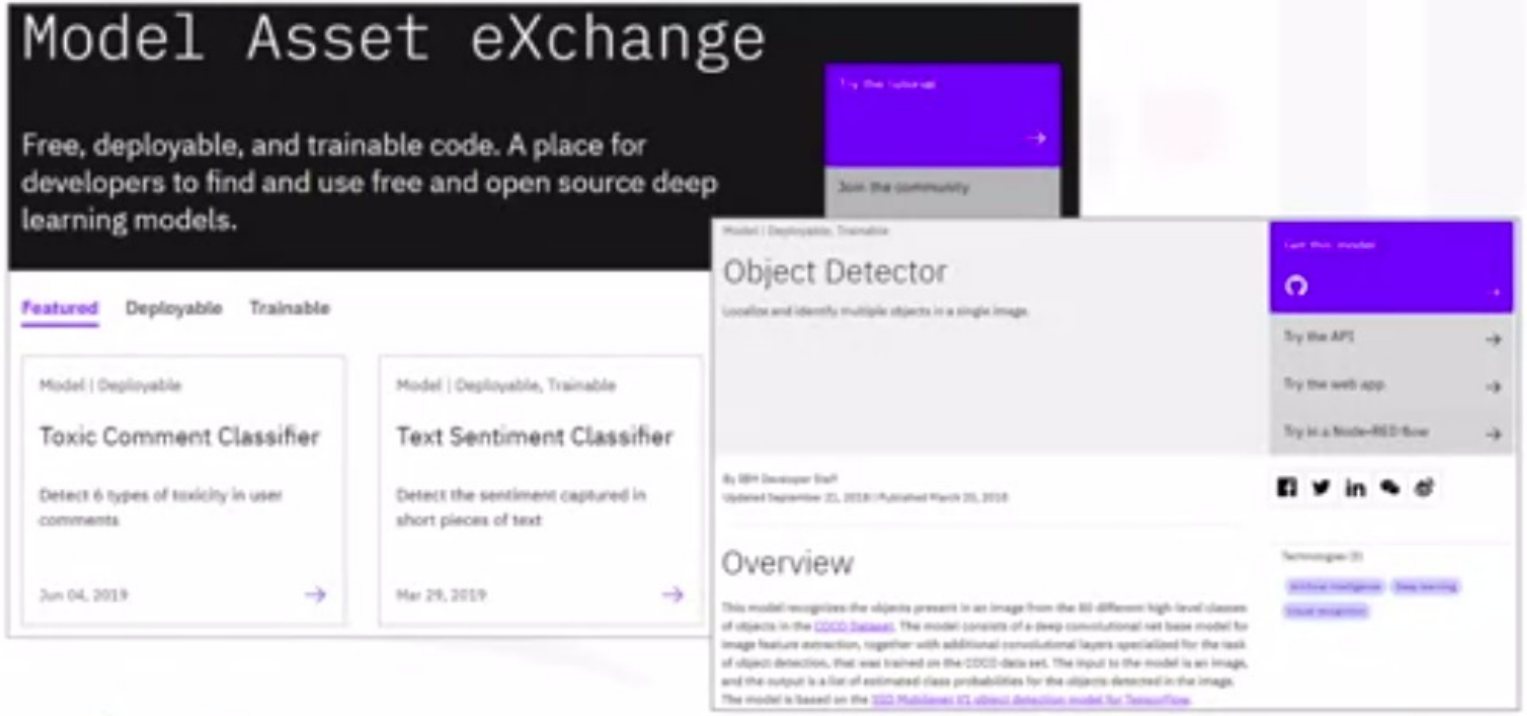
Iterative process:
Requires data, expertise, time, and resources

Time to value

This is a teddy bear

Summary

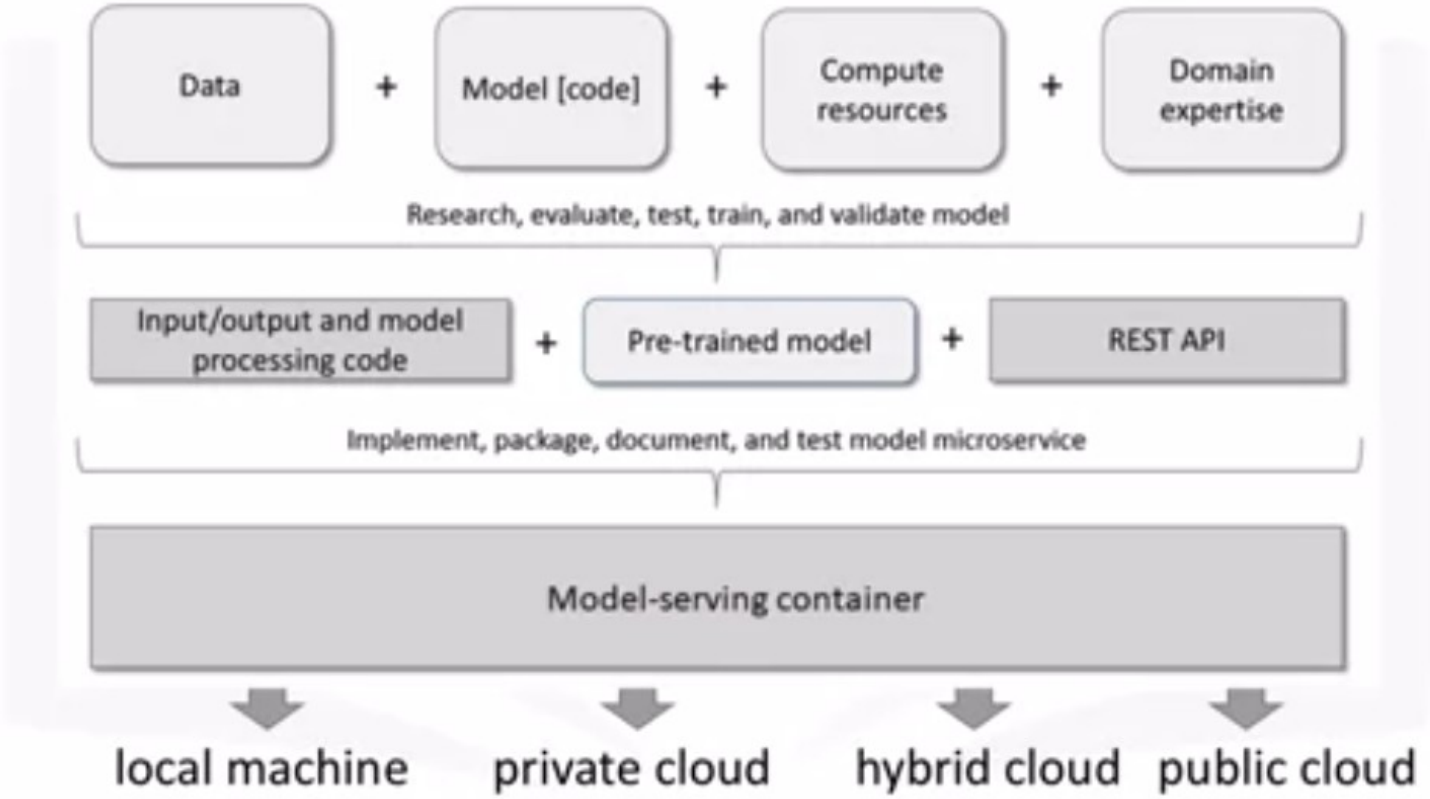
https://developer.ibm.com/exchanges/models/



MAX reduces time to value

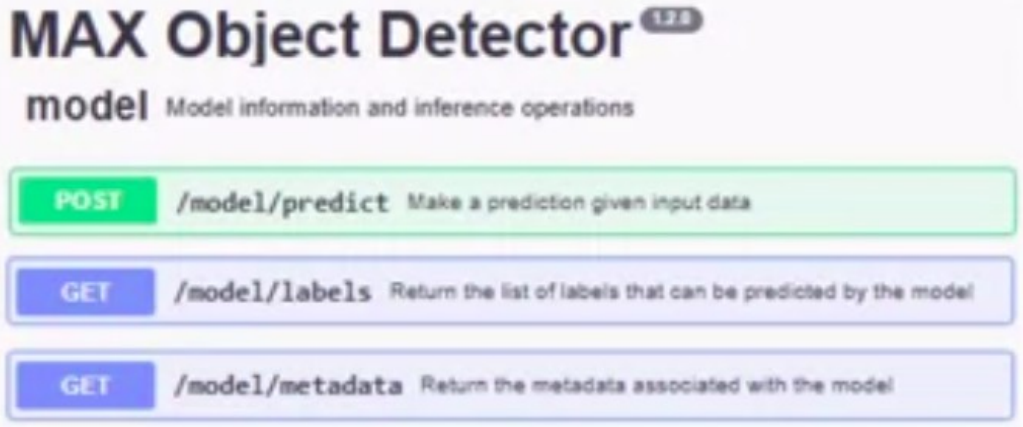
- Free open-source deep learning microservices
  - Use pre-trained or custom-trainable state-of-the-art models
  - Fully tested, deploy in minutes
  - Approved for personal and commercial use
- Available for variety of domains:
  - Object detection (“which objects are in this image”)
  - Image, audio, and text classification (“what is in this …”)
  - Named Entity recognition (“identify entities in text”)
  - Image-to-Text translation (“generate image caption”)
  - Human pose detection

MAX model-serving microservice



Model-serving microservice API

- Model-serving microservices expose standardized REST API



Prediction/scoring endpoint

Metadata endpoints

- Application-friendly inputs and outputs

Prediction request handling